

CLAIMS

We claim:

1. A data collection and processing system for use with meter devices that measure a utility, the system comprising:

multiple data collection devices each coupled to multiple meter-reading modules configured for transmitting collected meter-reading information to the data collection devices, wherein each of the data collection devices generates a message having a payload, the message comprising:

header information identifying a source of the message; and
a first packet having a first type of meter data and a second packet having a second type of meter data distinct from the first type of meter data, wherein the first packet and the second packet comprise at least a portion of the payload; and

a head-end subsystem comprising:

an interface component for receiving the message from the multiple data collection devices, wherein the message is received over a communication link;

a first specialized packet processor configured for processing only the first type of data;

a second specialized packet processor configured for processing only the second type of data; and

a message organizer component effectively coupled to the first packet processor and the second packet processor, wherein the message organizer is configured for delegating the first packet to the first specialized packet processor and delegating the second packet to the second specialized packet processor.

2. The system of claim 1 further comprising a wireless network configured for communication between the multiple meter-reading modules and the multiple data collection devices.

3. The system of claim 1 wherein the first packet and the second packet include header information having a signature identifying the type of data, and wherein the head-end subsystem further comprises a data store containing signature keys that are checked against the packet signatures.

4. In a utility meter-reading system, a data processing system for processing data collected by an embedded data collection device, the system comprising:

an interface component for receiving a message from the embedded data collection device, wherein the message is received over a communication link, wherein the message contains a first packet having a first type of data and a second packet having data a second type of data distinct from the first type, and wherein the first type of data is utility consumption data collected from one or more utility meters;

a first packet processor for processing only the first type of data;

a second packet processor for processing only the second type of data;

a message organizer component configured for validating the received message and for delegating the first packet to the first packet processor and the second packet to the second packet processor based on data type.

5. The system of claim 4 wherein the first packet processor and the second packet processor process data asynchronously.

6. The system of claim 4 further comprising a data store for use by the message organizer in delegating the first packet to the first packet processor and delegating the second packet to the second packet processor, wherein the data store has a first key corresponding to data of the first type and a second key corresponding to data of the second type.

7. The system of claim 4 wherein the interface component includes an Active Server Page (ASP) running on an Internet Information Service (IIS)

component, and wherein the Active Server Page (ASP) communicates with the message organizer.

8. The system of claim 4 wherein the message organizer is further configured for data decompression.

9. The system of claim 4 wherein the message organizer, the first packet processor, and the second packet processor are queued components.

10. The system of claim 4 further comprising an archive component configured for archiving data in the received messages.

11. The system of claim 4 wherein the first packet processor and the second packet processor share the same interface.

12. The system of claim 4 wherein the first type of data is alarm data collected from one or more utility meters.

13. The system of claim 4 wherein the first type of data is tamper data collected from one or more utility meters.

14. The system of claim 4 wherein the first type of data is interval data collected from one or more utility meters employing solid state demand techniques.

15. The system of claim 4 wherein the first type of data is interval data collected from one or more water utility meters monitoring water consumption.

16. The system of claim 4 wherein the message is a recursive data structure having a message within the message.

17. The system of claim 4 wherein the message is encrypted.

18. The system of claim 4 wherein the packet header includes signature information that identifies the type of data in each packet.

19. The system of claim 4 wherein a first data collection device is running on a first version of software having a first set of data types and wherein the second data collection device is running on a second version of software having a second set of data types distinct from the first set.

20. The system of claim 4 wherein the message is encapsulated in a standard protocol wrapper.

21. A computer-readable medium containing a data structure configured for transmission to a head-end system, wherein the message includes payload information collected from a data collection device configured for recording consumption data associated with at least one metered device, the message comprising:

header information, wherein the header information includes a device identifier and a message identifier; and

a first packet containing data of a first type and a second packet containing data of a second type distinct from the first type, wherein the first packet and the second packet comprise at least a portion of the payload information for the message, and wherein the first packet and the second packet each include a header having a signature identifying the first or second type of data contained in the packet.

22. The computer-readable medium of claim 21 wherein the first packet and the second packet include data in binary form.

23. The computer-readable medium of claim 21 wherein the header information includes data in binary form.

24. The computer-readable medium of claim 21 wherein the message is encapsulated in an HTTP or HTTPS wrapper.

25. The computer-readable medium of claim 21 wherein the computer-readable medium is a logical node in a computer network receiving the contents.

26. The computer-readable medium of claim 21 wherein the computer-readable medium is a computer-readable disk.

27. The computer-readable medium of claim 21 wherein the computer-readable medium is a data transmission medium transmitting a generated data signal containing the contents.

28. The computer-readable medium of claim 21 wherein the computer-readable medium is a memory of a computer system.

29. At an embedded data collection device, a method of generating a message containing collected data destined for processing at a head-end system, the method comprising:

generating a first packet corresponding to a first type of collected data and a second packet corresponding to a second type of collected data, wherein the first packet and the second packet include a header containing a signature identifying the type of collected data;
assembling the packets into a message, wherein the message includes message header information identifying the data collection device;
encapsulating the message in a standard protocol wrapper; and
transmitting the encapsulated message to the head-end system via a communication link.

30. The method of claim 29 wherein the embedded data collection device is coupled to one or more meter-reading modules, wherein the packets include one or more data records, and wherein each of the data records has a one-to-one correspondence with the one or more meter-reading modules coupled to the data collection device.

31. A method for processing messages received from multiple data collection devices, the method comprising:

receiving a message from a data collection device, the message comprising:

a first packet having a first type of data and a first packet header containing a first signature, wherein the first type of data includes data recorded at a utility meter; and

a second packet having a second type of data and a second packet header containing a second signature, wherein the second type of data is distinct from the first type of data;

validating the message, wherein the validating includes looking-up the first and second signatures in a data base table; and

delegating the first packet to a first processor configured for processing the first type of data and delegating the second packet to a second processor configured for processing the second type of data, wherein the delegating is based, at least in part, on the signature of the packet.

32. The method of claim 31 further comprising modifying the system to handle messages containing a third type of data by adding a third packet processor for processing the third type of data.

33. The method of claim 31, wherein the multiple data collection devices include a first data collection device running on a first software version and a second data collection device running on a second software version, and wherein the first software version includes a first set of data types including the first type of data and the second type of data, and wherein the second software version includes a second set of data types including a third type of data and a fourth type of data.

34. The method of claim 31 wherein the received message is compressed upon receipt, and wherein the validating includes decompressing the received message.

35. A system for processing messages received from multiple data collection devices, the system comprising:

means for receiving a message from a data collection device, the message comprising:

a first packet having a first type of data and a first packet header containing a first signature; and

a second packet having a second type of data and a second packet header containing a second signature, wherein the second type of data is distinct from the first type of data;

means for validating the message, wherein the validating includes looking up the first and second signatures in a data base table; and

means for delegating the first packet to a first processor configured for processing the first type of data and delegating the second packet to a second processor configured for processing the second type of data, wherein the delegating is based, at least in part, on the signature of the packet.

AMENDED CLAIMS

[Received by the International Bureau on 03 August 2004 (03.08.2004);
original claims 1-35 replaced by amended claims 1-35
(8 pages)]

CLAIMS

We claim:

1. A data collection and processing system for use with meter devices that measure a utility, the system comprising:
 - multiple data collection devices associated with an automatic meter reading system, wherein each of the multiple data collection devices is coupled to multiple meter-reading modules configured for transmitting collected meter-reading information to the data collection devices, and wherein each of the data collection devices generates a message having a payload, the message comprising:
 - header information identifying a source of the message; and
 - a first packet having a first type of meter data and a second packet having a second type of meter data distinct from the first type of meter data, wherein the first packet and the second packet comprise at least a portion of the payload; and
 - a head-end subsystem comprising:
 - an interface component for receiving the message from the multiple data collection devices, wherein the message is received over a communication link;
 - a first specialized packet processor configured for processing only the first type of data;
 - a second specialized packet processor configured for processing only the second type of data; and
 - a message organizer component effectively coupled to the first packet processor and the second packet processor, wherein the message organizer is configured for delegating the first packet to the first specialized packet processor and delegating the second packet to the second specialized packet processor.

2. The system of claim 1 further comprising a wireless network configured for communication between the multiple meter-reading modules and the multiple data collection devices.

3. The system of claim 1 wherein the first packet and the second packet include header information having a signature identifying the type of data, and wherein the head-end subsystem further comprises a data store containing signature keys that are checked against the packet signatures.

4. In a utility meter-reading system, a data processing system for processing data collected by an embedded data collection device, the system comprising:

an interface component for receiving a message from the embedded data collection device, wherein the message is received over a communication link, wherein the message contains a first packet having a first type of data and a second packet having data a second type of data distinct from the first type, and wherein the first type of data is utility consumption data collected from one or more utility meters monitored using automatic meter reading techniques; a first packet processor for processing only the first type of data; and a second packet processor for processing only the second type of data;

5. The system of claim 4 wherein the first packet processor and the second packet processor process data asynchronously.

6. The system of claim 4 further comprising:

a message organizer component configured for validating a structure of the received message and for delegating the first packet to the first packet processor and the second packet to the second packet processor based on a signature key of the first packet and a signature key of the second packet; and

a data store for use by the message organizer component in delegating the first packet to the first packet processor and delegating the second packet to the second packet processor, wherein the data store has a first key corresponding to data of the first type and a second key corresponding to data of the second type.

7. The system of claim 4 wherein the interface component includes an Active Server Page (ASP) running on an Internet Information Service (IIS) component, and wherein the Active Server Page (ASP) communicates with the message organizer.

8. The system of claim 4 wherein the message organizer component is further configured for data decompression.

9. The system of claim 4 wherein the message organizer component, the first packet processor, and the second packet processor are queued components.

10. The system of claim 4 further comprising an archive component configured for archiving data in the received messages.

11. The system of claim 4 wherein the first packet processor and the second packet processor share the same interface.

12. The system of claim 4 wherein the first type of data is alarm data collected from one or more utility meters.

13. The system of claim 4 wherein the first type of data is tamper data collected from one or more utility meters.

14. The system of claim 4 wherein the first type of data is interval data collected from one or more utility meters employing solid state demand techniques.

15. The system of claim 4 wherein the first type of data is interval data collected from one or more water utility meters monitoring water consumption.

16. The system of claim 4 wherein the message is a recursive data structure having an additional message within the message.

17. The system of claim 4 wherein the message is encrypted.

18. The system of claim 4 wherein the packet header includes signature information that identifies the type of data in each packet.

19. The system of claim 4 further comprising a message organizer component configured for validating a structure of the received message and for delegating the first packet to the first packet processor and the second packet to the second packet processor based on a signature key of the first packet and a signature key of the second packet.

20. The system of claim 4 wherein the received message is encapsulated in a standard protocol wrapper.

21. A computer-readable medium containing a data structure configured for transmission to a data processor component in an automatic meter reading system, wherein the message includes payload information collected from a data collection device configured for recording consumption data associated with at least one metered device that is monitored by the automatic meter reading system, the message comprising:

header information, wherein the header information includes a device identifier for identifying the device configured for recording

consumption data associated with the at least one metered device that is monitored using the automatic meter reading system and a message identifier for identifying the message; and

a first packet containing data of a first type and a second packet containing data of a second type distinct from the first type, wherein the first packet and the second packet comprise at least a portion of a message body for the message, wherein the message body for the message includes data associated with the monitoring of the automatic meter reading system, and wherein the first packet and the second packet each include a header having an identifier identifying the first or second type of data contained in the packet.

22. The computer-readable medium of claim 21 wherein the first packet and the second packet include data in binary form.

23. The computer-readable medium of claim 21 wherein the header information includes data in binary form.

24. The computer-readable medium of claim 21 wherein the message is encapsulated in an HTTP or HTTPS wrapper.

25. The computer-readable medium of claim 21 wherein the computer-readable medium is a logical node in a computer network receiving the contents.

26. The computer-readable medium of claim 21 wherein the computer-readable medium is a computer-readable disk.

27. The computer-readable medium of claim 21 wherein the computer-readable medium is a data transmission medium transmitting a generated data signal containing the contents.

28. The computer-readable medium of claim 21 wherein the computer-readable medium is a memory of a computer system.

29. At an embedded data collection device, a method of generating a message containing collected data destined for processing at a collective processing component in an automatic meter reading system, the method comprising:

generating a first frame corresponding to a first type of data collected by the embedded data collection device and a second frame corresponding to a second type of data collected by the embedded data collection device, wherein the first frame and the second frame include a header containing a signature identifying the type of collected data;

assembling the generated frames into a message, wherein the message includes message header information identifying the data collection device;

encapsulating the message in a standard protocol wrapper; and transmitting the encapsulated message to the head-end component in the automatic meter reading system via a communication link.

30. The method of claim 29 wherein the embedded data collection device is coupled to one or more meter-reading modules, wherein the frames include one or more data records, and wherein each of the data records has a one-to-one correspondence with the one or more meter-reading modules coupled to the data collection device.

31. A method for processing messages received from multiple data collection devices used in an automatic meter reading system, the method comprising:

receiving a message from a data collection device configured for collecting utility consumption data for use in the automatic meter reading system, the message comprising:

a first packet having a first type of data and a first packet header containing a first identifier, wherein the first type of data includes data recorded at a utility meter; and
a second packet having a second type of data and a second packet header containing a second identifier, wherein the second type of data is distinct from the first type of data;
validating the message, wherein the validating includes looking-up the first and second identifiers in a data base table; and
delegating the first packet to a first processor configured for processing the first type of data and delegating the second packet to a second processor configured for processing the second type of data, wherein the delegating is based, at least in part, on the signature of the packet.

32. The method of claim 31 further comprising modifying the system to handle messages containing a third type of data by adding a third packet processor for processing the third type of data.

33. The method of claim 31, wherein the multiple data collection devices include a first data collection device running on a first software version and a second data collection device running on a second software version, and wherein the first software version includes a first set of data types including the first type of data and the second type of data, and wherein the second software version includes a second set of data types including a third type of data and a fourth type of data.

34. The method of claim 31 wherein the received message is compressed upon receipt, and wherein the validating includes decompressing the received message.

35. A system for processing messages received from multiple data collection devices in an automatic meter reading system, the system comprising:

means for receiving a message from a data collection device in the automatic meter reading system, the message comprising:

a first packet having a first type of data and a first packet header containing a first signature; and

a second packet having a second type of data and a second packet header containing a second signature, wherein the second type of data is distinct from the first type of data;

means for validating the message, wherein the validating includes looking up the first and second signatures in a data base table; and

means for delegating the first packet to a first processor configured for processing the first type of data and delegating the second packet to a second processor configured for processing the second type of data, wherein the delegating is based, at least in part, on the signature of the packet.